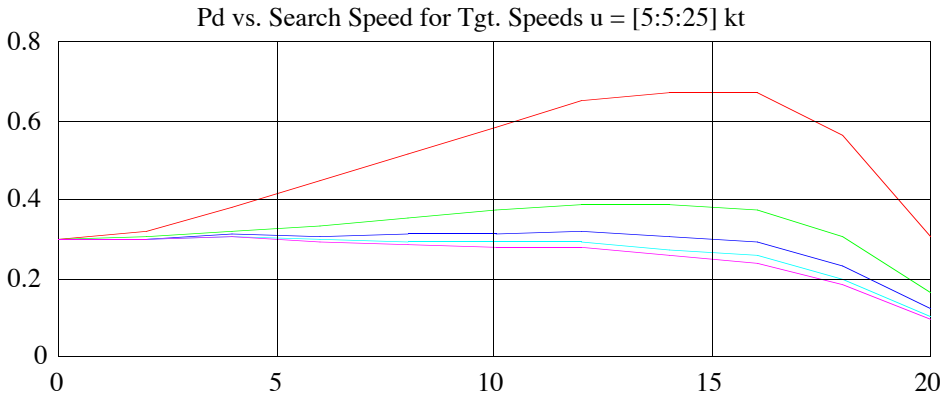
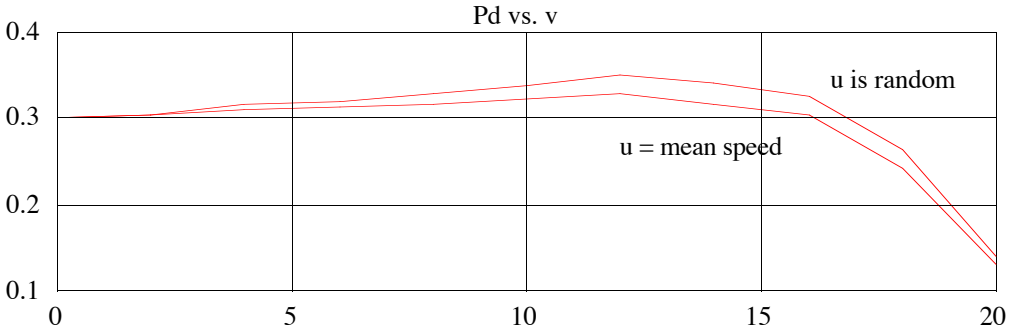
Search and Detection
Barrier Search

1. For searcher speeds (v) of 0:2:20 kt, detection ranges (R) of a target attempting to cross a barrier are [12, 12, 12, 11.5, 11, 10.5, 10, 9, 8, 6, 3] nm. The barrier width is 80 nm. For target speeds (u) of 5:5:25 kt, use the formula Pd = min(1, 2R/L * $\sqrt{1+(v/u)^2}$) and MATLAB to plot curves of Pd vs. v. Identity the maximizing search speed v* for each target speed u. Your plot should look like this:



2. Now suppose that based on historical data, it is determined that the probability of next target being at speed u = 5:23 is [.01 .02 .03 .04 .05 .06 .07 .08 .09 .1 .09 .08 .07 .06 .05 .04 .03 .02 .01]. Use MATLAB to plot Pd vs. v for this target with a random speed.

3. If you had not studied conditional probability, you might be tempted to use the mean target speed to plot Pd vs. v instead of conditioning on the entire target speed distribution. On the same plot, show Pd vs. v when the target's speed is the mean of the distribution in 2., and the Pd vs. v plot obtained in 2. You should get this:



Similar, but not identical.